

## Global Hydrology study

# 'Hot' cities find 'cool' results

by Kelly McFalls

Environmental planning for the 2002 Olympic games, strategies to reduce ozone levels, focused tree planting programs and identifying cool roofs are early spinoffs from a NASA urban study just concluding in three of the hottest U.S. cities.

Researchers from the Marshall Center flew a thermal camera, mounted on a NASA aircraft, over Baton Rouge, La.; Sacramento, Calif.; and Salt Lake City — taking each city's temperature. The thermal camera produced an image which pinpoints the cities' "hot spots."

Marshall researchers are using the images to study what types of surfaces in cities contribute to bubble-like accumulations of hot air, called urban heat islands.

*See Urban Study on page 5*



NASA photo by Emmett Given

## **Emotions soar at Marshall during liftoff of Space Shuttle Discovery**

Marshall employees gather in Bldg. 4200 to view the Oct. 29 televised launch of Space Shuttle Discovery and the STS-95 mission. Reacting to the successful launch are, from right, Center employees Axel Roth, Program Development director; Gertrude Conard, Employee and Organizational Development Office manager; Don Frazier, a chief scientist in the Space Sciences Laboratory; and Sylvia Thomas of the Human Resources Office.



NASA photo by Dennis Keim

# **Automated Rendezvous, Capture System being tested during STS-95**

by John Bryk

Key components of an experimental system that will allow spacecraft to automatically link up in orbit is being tested during the STS-95 Space Shuttle mission that launched Oct. 29.

Until now, the exacting maneuvers of rendezvous and docking depended on human control. The new Automated Rendezvous and Capture technology — developed by scientists at the Marshall Center — requires little or no ground or crew support.

The key to this new technology is the Marshall-developed Video Guidance Sensor. The guidance system includes a video camera and dual-frequency lasers.

Mission Specialist Steve Robinson, using Discovery's robotic arm, lifted a satellite — the SPARTAN solar physics spacecraft — from the Shuttle's cargo bay at 12:59 p.m. CST Nov. 1 and released it into orbit. SPARTAN deployed from the Shuttle's cargo bay to serve as a laser target during the tests. It was fitted with special reflectors. Lasers will shine on the SPARTAN, and a sensor in the Space Shuttle cargo bay will detect reflected laser

light to determine the spacecraft's exact position and distance from the Shuttle.

"We expect this new technology will free astronauts from a repetitive task and allow them to perform space science and other human-intensive activities," said Gene Beam, the system's project manager at Marshall. "Onboard sensors, computers and navigation inputs from satellites will provide all the information needed to complete docking maneuvers."

In ground testing, the guidance system has homed in on targets with an accuracy of one-tenth of an inch. Space testing of the system will collect tracking data from a moving target under space lighting conditions and at distances ranging from 3 to 220 yards from the Shuttle. The Shuttle's robot arm will place the Spartan in multiple predetermined positions, while the Shuttle

*See Guidance Sensor on page 5*

**"Safety should be first on your mind"**

*Safety slogan submitted by Mark King, EB14*

## Two Center employees receive AIAA awards

Marshall Center employees Paul Luz, PD21, and Melissa Van Dyke, EP63, have been named American Institute of Aeronautics and Astronautics (AIAA) 1997/1998 winners for the Alabama-Mississippi Section.

Luz, who received a second-place AIAA Public Policy Award, was recognized for stimulating public awareness of the needs and benefits of aerospace research and development, particularly on the part of government representatives. He was also cited for educating members in the value of public policy activities.

Van Dyke received the third-place AIAA Newsletter Award 1997/1998. She was cited for effective communication of AIAA local and national news, editorial comment and publication appearance.

## Group explores Fastrac commercialization

Marshall's Technology Transfer and Advanced Space Transportation Offices recently hosted a focus group session at Marshall to gather industry views on the commercialization of the Fastrac engine. Approximately 80 company representatives from across the United States were invited.

"Our goal is to make the United States and U.S. industry a leader," said Technology Transfer Office Director Sally Little. "To do this we must partner with industry and we need industry views on commercialization."

During the session, Fastrac Project Engineer Danny Davis explained how Fastrac is a "true refection of NASA's new philosophy — better, faster, cheaper."

Patent applications have been filed for three elements of the Fastrac engine technology — the rocket nozzle and combustion chamber structure; fuel injector; and the combination of the combustion chamber/nozzle with the injector to form the thrust chamber assembly.

## NASA policy, guidelines on program and project management topic of Nov. 9 meeting

A town hall meeting is scheduled for 1-3 p.m., Monday, Nov. 9 in Morris Auditorium for the official rollout of the NASA policy and guidelines on program and project management (7120.5a).

A senior management team, led by Acting Deputy Administrator Gen. John Dailey, will describe plans for NASA-wide implementation of the policy and take questions from the audience. Topics will include the purpose and importance of NPG 7120.5a; governing structure; what changes and what stays the same; major themes of 7120.5a; and professional development requirements and resources. Although targeted for employees in program and project management, the meeting is open to all NASA employees. Tickets for the meeting are available from administrative officers.

## NAFP director to brief employees Nov. 10

In an effort to increase Marshall's participation in the NASA Administrator's Fellowship Program (NAFP), Lynda Sampson, NASA Headquarters NAFP director, will visit the Center to brief interested employees. The briefing will be held from 9:30-10:30 a.m., Tuesday, Nov. 10 in Bldg. 4203, room 1201.

The fellowship program is designed to enhance the professional development of NASA employees and the science, mathematics and engineering faculty of minority-serving institutions. For information, call Willie Love of Marshall's Equal Opportunity Office at 544-0088.



NASA photo by Adeline Byford

## Griner welcomes AIAA Conference attendees

Center Deputy Director Carolyn Griner welcomed attendees on Oct. 28 to the American Institute of Aeronautics and Astronautics 1998 Defense and Space Programs Conference at the Von Braun Center. Seated is Larry Knaur, AIAA conference executive chairman.

## Under the Outsourcing Desktop Initiative for NASA Maryland firm to provide information technology services for Marshall

NASA has selected OAO Corporation of Greenbelt, Md., to provide information technology services for the four Office of Space Flight centers, including the Marshall Center, under the Outsourcing Desktop Initiative for NASA (ODIN).

The services will be ordered under the existing ODIN master contract, which is administered by the ODIN Program Office at Goddard Space Flight Center in Maryland. They include comprehensive desktop computer, server, local area network, telephone, local video, administrative radio, remote communication and public address services.

Kennedy Space Center, Fla., is the lead service center for the Office of Space Flight ODIN delivery orders, which covers the Marshall Center; Kennedy Space Center; Johnson Space Center, Texas; and Stennis Space Center, Miss.

There will be four firm fixed-priced delivery orders, one for each Office of Space Flight center. The period of performance is approximately three years beginning on May 1, 1999, at Marshall; Dec. 1, 1998, at Kennedy; Jan. 1, 1999, at Johnson; and Feb. 1, 1999, at Stennis. Each of the delivery orders will expire concurrently on Nov. 30, 2001.

The total value for the four delivery orders is estimated at \$154.9 million. The breakdown by center is \$41.7 million for Marshall, \$76.7 million for Johnson, \$21 million for Kennedy, and \$15.5 million for Stennis.

Six other firms are part of the pool of information technology contractors, which are available for selection under the ODIN master contract. They are Boeing Information Services Inc., Vienna, Va.; Computer Sciences Corp., Laurel, Md.; DynCorp TECHSERV, LLC, Reston, Va.; FDC Technologies, Bethesda, Md.; RMS Information Systems Inc., Lanham, Md.; and Wang Government Systems Inc., McLean, Va.



# Major milestone achieved using friction stir welding

by Chip Jones

Materials and Processes Laboratory

A team of NASA and Lockheed Martin personnel, working in support of the External Tank Shuttle Upgrades Program, has achieved a major milestone in the use of friction stir welding.

Working in Bldg. 4705 of the Productivity Enhancement Complex, the team used this process to fabricate a full-sized simulation of an external tank liquid hydrogen barrel assembly. This is the largest piece of hardware welded in the United States with this process. It is also the first use of friction stir welding on full size structural elements made with the super lightweight tank's new aluminum lithium alloy.

The Welding Institute in England originally developed the friction stir welding process. This welding technique employs a rotating dowel that is forced under an intense pressure into the joint of two abutting parts. The pressure combined with the rotational force of the dowel creates a frictional force on the parts. As the friction heats the material to a malleable state, the dowel mechanically stirs the metal from both sides of the joint into a sound weld.

Unlike a fusion weld, the process requires neither inert shielding gas or filler material. Since the physical state of the material is unchanged, the distortion and loss of physical strength of the parts, which are typical in a fusion welds, does not occur. The new process is particularly applicable to aluminum welding, and is being used in Europe to make components for the ship-building industry.

"Friction stir welding is ideally suited for joining the aluminum-lithium alloy used for the super lightweight tank, because it joins the panels without melting the metal," said Dr. Arthur Nunes, an analyst for Marshall's Metallurgical Research and Development Branch. "When aluminum-lithium alloys are melted in conventional welding processes, great care must be taken that intergranular molten metal films still present after most of the metal has solidified are not subjected to thermal stresses sufficient to rupture the films. Subtle changes in fusion welding processes may result in cracks that reduce weld strength and must be repaired. This problem is completely avoided in the friction stir process."

The new process has been under development by the Materials and Processes Laboratory for the last three years. It produced very good welds under laboratory conditions.

To determine if its advantages could be carried over to full-sized parts, a welding system in the Productivity Enhancement Complex was converted from fusion welding to friction stir through a cooperative effort between NASA, Lockheed Martin and the Nicholson Machine Tool Corp. of Seattle, Wa. Since this



NASA photo by Emmett Given

**From Left, Marshall's Parker Counts, External Tank Project manager; and Chip Jones, team leader for Metals Processes Development; view samples made by the friction stir welding process with Zack Loftus, a Lockheed Martin weld engineer.**

setup is similar to three fixtures that produce parts for external tanks at the Michoud Assembly Facility in New Orleans, it was ideal to demonstrate the practicality of friction stir welding for production.

Several new technologies were developed for welding these parts. Special software was written to control deflection of the weld fixture to compensate for heavy loads at the weld tool. This feature allows for the use of existing welding fixtures currently in production and avoids the expense of new equipment. Nondestructive evaluation techniques for inspecting weld quality were developed to address the special features of the new process.

A joint effort between Marshall and The Welding Institute resulted in development of the first reference standards for inspecting these welds. A "retractable pin tool" mechanism was invented to allow the process to weld parts that vary in thickness along the joint.

The Retractable Pin Tool Development Team includes members from NASA, Boeing and Alabama A&M University in Huntsville.

"The full-sized external tank barrel section completed last week demonstrated the practicality of implementing friction stir on large space structures such as the external tank," said Stephen Brettel, Shuttle Upgrade Team Lead for the External Tank Project. "Marshall has a unique, world-class facility to develop this revolutionary new welding process."

The next step for the team is to develop circumferential welding of large-scale aluminum hardware, to be performed at Marshall's Productivity Enhancement Facility.

## Marshall Exchange Council seeks nominees

A special nominating committee is accepting names of nominees from employees for an election to fill two positions on the Marshall Exchange Council.

Names of nominees will be accepted by the committee when accompanied by a petition signed by 20 or more employees. Nominations may be made by employees at large and there is no requirement that nominees and petitioners be from the same organization.

Petitions must bear the signature of the nominee indicating a willingness to serve, if elected, and social security number, considered privacy act information, or Marshall badge number.

No Marshall employee may serve concurrently as a member of the Council and as an officer of any Exchange-sponsored club or activity.

Each candidate must have been a Marshall employee for not less than one year. The term of office is two years.

Deadline for submitting nominations is 4:30 p.m., Nov. 17. Petitions should be mailed to: Exchange Council Election, CO10X, Bldg. 4752.

The new Council members will take office in the new year and join one other elected member, Larry Gagliano. Four members of the seven-person Council are appointed by the Center director, chairman, operations manager, treasurer and secretary.

A list of nominees and voting instructions will be printed in the Dec. 2 issue of the Marshall Star and concurrently, ballots will be mailed to all employees.



NASA photo

### Center employee's artwork on display in cafeteria

Herb Sims, left, of Marshall's Astrionics Laboratory; and Steve Chrisman, manager of a Southern Food Service cafeteria at Marshall, hang artwork for display in the cafeteria of Bldg. 4203. The artwork, created by Sims, is the first to be displayed for sale in the cafeteria by a Marshall employee. For display guidelines, contact the NASA Exchange at 544-7564.

## Center pledges \$334,590 after fourth week of CFC

The Marshall Center's Combined Federal Campaign (CFC) has passed its fourth week with employees contributing \$334,590 to charitable organizations. The 1998 average gift at this time is \$216, compared to \$188 at the same time during last year's campaign.

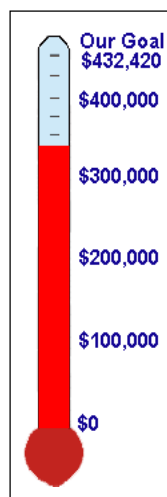
"The Marshall Center campaign is really an icon in the local federal community," said CFC Chairperson Cathy Nicholson. "We have gained the respect of other federal agencies because of the way we give.

"Approximately 84 percent of Marshall's employees gave last

year," added Nicholson. "We must realize, however, that our responsibilities

continue each year and that the community is looking to all of us for hope."

Center offices that have achieved 100 percent participation include: AB01, AL01, AM01, BF01, BF20, BF70, CC01, CE01, CO02, CO40, CO50, CO70, CR01, CR90, DA01, DE01, EB11, EB31, EE21, EE51, EJ33, EM41, GP01, HR10, JA01, JA02, JA10, JA21, JA41, JA51, JA52, JA63, MG01, MG10, MG30, PP01, PP04, SA45, SA52, TA21 and TA61.



## Guidance Sensor

*Continued from page 1*  
rotates, to study guidance system performance.

While the system is being tested in its automatic mode, an STS-95 crew member will operate and monitor the Video Guidance Sensor. The crew member will have primary control over the process at all times.

The Video Guidance Sensor and other Automated Rendezvous and Capture

elements have been ground tested at Marshall's Flight Robotics Laboratory. The Video Guidance Sensor and related technologies are being developed to support the upcoming International Space Station, reusable launch vehicles and other space systems.

The Spartan satellite is scheduled to be retrieved by the Shuttle at 2:45 p.m. CST Tuesday, prior to the deadline for the Marshall Star.



## Upcoming Events

### NASA Day set for Nov. 14 at Alabama A&M football game

The Equal Opportunity Office at Marshall is coordinating High School Senior Day/NASA Day at Alabama A&M University in Huntsville. The event will be held in conjunction with the Alabama A&M vs. Alcorn State football game scheduled for 1:30 p.m., Saturday, Nov. 14 at the Alabama A&M Stadium.

General admission tickets are \$12 each, students ages 6-12 years are \$5 each, and children under 6 years old will be admitted free. Tickets may be purchased from 8 a.m.-4:30 p.m., Monday-Friday at the NASA Exchange in Bldg. 4752. For more information, call Willie Love at 544-0088.

### Committee members sought for Marshall's 1999 Black History Celebration

Planning is under way for the Marshall Center's next Black History Celebration, to be observed February 1999. Employees interested in serving on the committee are invited to meet at 1 p.m., Tuesday, Nov. 10 in Bldg. 4200, room 409. For more information, contact Carolyn Landry at 544-0846.

### EDTeC offers employees training opportunity

The Employee and Organizational Development Office (EDTeC) is sponsoring the seminar "Act Like an Owner: Teaching Employees to Think and Act Like Owners of the Organization" from noon-2 p.m., Thursday, Nov. 5 in Bldg. 4200, room G13-1. The seminar also will be broadcast Centerwide on Marshall Continuing Learning Channel 14. Registration is necessary to receive credit for the course and participant materials. Employees may register via AdminSTAR. Registration deadline is 4:30 p.m. today with a class limit of 42. For more information, contact the EDTeC at 544-3343.

## Two Center employees recognized by NASA

NASA has recognized Kim Whitson as Contract Manager of the Year and Dwight Clark as Procurement Support Person of the Year. Both work in the Procurement Office at the Marshall Center.

Center Director Art Stephenson presented the awards to Whitson and Clark during his recent all-hands meeting.

Whitson, team lead and contracting officer for the Shuttle Solid Team, was cited for his exemplary management of NASA's Space Shuttle Reusable Solid Rocket Motor and Solid Rocket



**Kim Whitson**

Booster contracts. The combined value of these and other related contracts directed by Whitson exceeds \$6.5 billion. Whitson joined the Marshall Center in 1988.



**Dwight Clark**

Clark, a senior computer scientist, was recognized for his innovative work in the development and operation of several software applications to enhance procurement systems and operations. Clark worked as a contractor supporting Marshall's Procurement Office for 12 years before joining NASA in 1997.

## Urban study

*Continued from page 1*

The bubbles of hot air develop over cities as naturally vegetated surfaces are replaced with asphalt, concrete, rooftops and other man-made materials.

"One thing's for sure, the three cities we've looked at were hot! They can use a lot of trees and reflective rooftops," said the study's lead investigator, Dr. Jeff Luvall of the Global Hydrology and Climate Center at Marshall.

Salt Lake City is using the early results to help plan sites for the 2002 Olympic Games and develop strategies to reduce ground-level ozone concentrations in the Salt Lake City valley. Not to be confused with the "good" ozone layer protecting Earth from ultraviolet rays, ground-level ozone is a powerful and dangerous respiratory irritant found in cities during the summer's hottest months.

In Sacramento and Baton Rouge, city planners and tree planting organizations are using the study to focus their tree-planting programs. "We are helping the cities incorporate the study into their urban planning," said Maury Estes, an urban planner on the science team at Marshall. "By choosing strategic areas in which to plant trees and by encouraging the use of light-colored, reflective building material, we think that the cities can be cooled."

The science team will continue to analyze the thermal heat information and

work with the cities to implement future results into the cities' plans. Based on the results of the project, the team plans to disseminate its findings nationally so other cities can incorporate what the team has learned into their long-range growth plans.

The urban heat island study is supported by NASA's Earth Science Enterprise. The enterprise is responsible for a long-term, coordinated research effort to study the total Earth system and the effects of natural and human-induced changes on the global environment.

The project also is aimed at the enterprise's efforts to make more near-term economic and social benefits of Earth science research and data products available to the broader community of public and private users.

Working on the study are researchers from the Marshall Center; the Environmental Protection Agency, Washington, D.C.; the Department of Energy, Washington, D.C.; Lawrence Berkeley National Laboratory, Berkeley, Calif.; Baton Rouge Green, La.; the Sacramento Tree Foundation, Calif.; Tree Utah, Salt Lake City; and the Utah State Energy Services Department, Salt Lake City.

More information on the study and research updates may be found in the new Marshall Center Virtual News Center at the following Web site:  
<http://www.msfc.nasa.gov/news>

## Employee Ads

### Miscellaneous

- ★ Autumn-haze full-skin female mink stroller, size 16; new beige wool dress, size 12. 883-2924
- ★ Aquarium, 30-gal., with power lead, under gravel filter, back filter, iron stand, \$100. 851-6425
- ★ Couch and love seat, Southwestern pattern, teal, beige, brown, orange, \$150. 830-9507 after 5 p.m.
- ★ Go cart, 5HP, roll cage, two-seater, other safety features, \$500. 837-2461
- ★ 20-gallon fish tank w/filter, pump, hood and accessories, \$20; Kirby vacuum cleaner w/ attachments, \$20. 830-1346
- ★ Sears treadmill, 3500ps, adjustable incline, programmable speed, electronic timer, distance, pulse, and calorie timer, \$300. 883-0313
- ★ Double yellow-head Amazon, 5 years old, talks, with cage, accessories, \$300. 423-3376
- ★ Living room sofa, off-white, 96", \$25; Frigidaire electric stove-top/ventilator, \$10. 881-1249
- ★ Snapper riding lawn mower, 12HP, 33 Hi-Vac disc drive and pull behind trailer, \$900. 837-2223
- ★ Minolta camera, SRT 101, 35mm w/50mm F1.4 lens, flash, case and strap, \$75 obo. 461-7934
- ★ Murray 20" 5-spd. mountain bike for child 4-8 years old, \$35. 859-6475
- ★ AKC toy poodles, two males, \$250 each; Ford engine, 351-M, 100K miles, has carburetor/exhaust manifolds, \$150. 753-2278
- ★ Oak full-size bedroom suite w/night stands, dresser and chest, \$350. 776-5422

### Vehicles

- ★ 1993 Toyota Camry LE, auto., 4-dr., black, gold package, \$7,750. 355-2052
- ★ 1989 Suzuki, red, 106K miles, \$2,700. 830-6655
- ★ 1991 Toyota Celica coupe, air, automatic, powered sunroof, alloy wheels, red, \$5,000. 864-3133
- ★ 1993 Ford Aerostar XLT minivan, 109K miles, \$6,000; 1991 Honda Accord LX, 120K miles, \$3,500. 837-0846
- ★ 1991 Honda Accord, LX, 5-spd., 120K miles, \$3,500 obo. 837-0846
- ★ 1994 Chevrolet truck, extended cab, V-8, Silverado, silver/blue, \$12,000. 880-3765
- ★ 1995 Mustang GTS, V-8, red, all power, 45K miles, \$11,000. 721-9698
- ★ 1986 Olds Calais Supreme, 4-dr., automatic, 6-cylinder, A/C, cruise, PB/PS, PO/PW, \$1,750. 881-1867
- ★ 1994 Buick LeSabre Limited, records, \$10,500. 353-4922

## Wanted

- ★ Huntsville Times newspapers, Aug. 11, 12, 13, and 14, 1998. 539-2951
- ★ Ride to work, 7 or 7:30 a.m. shift, Governors Drive/Huntsville Hospital area, will pay \$6 a day. 534-5398
- ★ Used modem and FTP software for 386 PC, Windows 3.1. 882-7084

## Found

- ★ Black clip-on eyeglass case in parking lot next to bldg. 4203. 544-0044

## Center Announcements

- ✦ **Annual Nut Sale** — Marshal is offering Center employees, on-site contractors and retirees the opportunity to purchase a variety of nuts during the annual Nut Sale from 8 a.m.-4 p.m. beginning Nov. 20 in Marshall's Activities Bldg. 4752. Available on a first-come-first-serve basis will be pecans (fancy, mammoth halves) for \$5.25 per pound; chocolate-covered pecans for \$6.75 per pound; English walnuts for \$3.25 per pound; jumbo raw peanuts for \$1.75 per pound; roasted, salted (in shell) natural pistachios for \$3.25 per pound; dry-roasted cashews at \$5.25 per pound; hickory-smoked almonds at \$3 per 12 ounces; natural, whole almonds for \$3.25 per 12 ounces; and honey-roasted almonds at \$3 per 12 ounces.
- ✦ **Open Season Health Fair** — The 1999 Federal Employees Health Benefits Open Season Health Fair will be held from 9 a.m.-3 p.m. Nov. 5 in Bldg. 4203, room 1201. The open season begins Monday, Nov. 9, and continues through Monday, Dec. 14. Comparison charts and brochures will be available Nov. 9 from the employees' Administrative Office.
- ✦ **Emergency Warning System Test** — The monthly test of the Emergency Warning System at Marshall is scheduled for 3 p.m. Thursday. This is an audio test only, and employees should not evacuate to protective areas. If severe weather is occurring at this time, the test will be rescheduled to a later date. Safety coordinators and monitors should send reports of malfunctioning speakers to: AB11/Emergency Preparedness Officer at 544-5187 as soon as possible.
- ✦ **MARS Tennis Club** — The MARS Tennis Club held its Hi-Lo Doubles Tournament Oct. 24. First place went to Fred Hermann and Ronda Moyers, with second-place awarded to Tony Kim and Ken Hinkle. The MARS Tennis Club will host a season-ending party during the first week in December, where the new Club officers will be announced. **Contact:** Mike

Moore at 544-7176; Tom Sutherland at 544-7704; or Bill Baker at 544-6686

- ✦ **MARS Ballroom Dance Club** — The MARS Ballroom Dance Club will offer polka and tango lesson from 7-8 p.m., Nov. 9, 16 and 23 in Parish Hall of St. Stephen's Episcopal Church, 8020 Whitesburg Drive. Lesson cost is \$8 per person and available to MARS Ballroom Dance Club members, partners and guests. **Contact:** Pat Sage, 544-5427
- ✦ **Quality Lab Reunion** — The second reunion luncheon of the Quality Laboratory will be held at 11 a.m. Nov. 12 at the Redstone Officers Club. Reservations are required. **Contact:** Frank Batty, 536-9187, Art Carr, 881-8432, Dick Henritze, 534-8312 or P.M. Hughes, 881-1937
- ✦ **MARS Fishing Club** — The next MARS Fishing Club tournament "Live Bait" is scheduled for Saturday Nov. 14 at Safety Harbor on Wilson Lake. **Contact:** John Pea at 544-8437, Don McQueen at 544-9073 or Charlie Nola at 544-6367
- ✦ **40th Anniversary T-shirts** — The second order of T-shirts commemorating NASA's 40th anniversary has been received. T-shirts are available from 8 a.m.-4:30 p.m. Monday-Friday at the Marshall Center Activities Bldg. 4752.
- ✦ **American Express Vacation Office** — The American Express Vacation Office at Marshall will be closed Nov. 2-19. For vacation travel arrangements or concerns during these date, **contact** the American Express Travel Office at the following NASA Centers: Kennedy Space Center, (407) 867-3927; Lewis Research Center, (216) 433-6342; or Dryden Flight Research Center, (805) 258-2375.
- ✦ **NASA Exchange** — Mattel's Mars Rover Action Pack at \$5 each and the Marshall Center "Beanie Baby" space suits at \$3.25 each are available from 8 a.m.-4:30 p.m. Monday-Friday at the NASA Exchange, Bldg. 4752. The special edition "John Glenn Action-Pack Hot Wheels" have temporarily sold out, and have been re-ordered. **Contact:** NASA Exchange, 544-7564

## Job Opportunity

**CPP 99-1-JB, AST, Technical Management, GS-801-14**, Space Shuttle Projects Office, External Tank Project. Closes Nov. 5.  
**CPP 99-4-RE, AST, Technical Management, GS-801-13/14**, Program Development, Program Planning Office, Engineering Cost Office. Closes Nov. 12.  
**CPP 99-6-DC, AST, Data Systems, GS-854-14**, S&E, Astrionics Laboratory, Software & Simulation Division, Software Development Branch. Closes Nov. 4.

# MARSHALL STAR

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